Electrical Design Review Checklist for Military Projects

Scope

This instruction covers the Electrical Design Review Checklist for Military Projects. It outlines the features and elements that should be checked to perform a proper electrical design review.

Distribution

Electrical Engineer*

Ownership

The Electrical Engineer [John.R.Parrish@usace.army.mil?Subject=INSP24L0-Electrical Design Review Checklist for Military Projects] is responsible for ensuring that this document is necessary and that it reflects actual practice.

References

Refer to:

- *UFC 4-021-01 Design and O&M: Mass Notification Systems [http://www.wbdg.org/ccb/DOD/UFC/ufc_4_021_01.pdf]*
- *Integrating Lessons Learned [PROA04L0]*

Activity Preface

These tasks are performed whenever a Project Manager requests a review of a Electrical Design.

Prior Activity

Contract Review [PROP01L0]

Electrical Engineer

1. Determine the level of review required.

   There are three levels of review:
   - If work looks professionally complete and there is a good PM on the project, then only crucial issues need review.
   - If work appears incomplete, then another level of investigation is added.
   - If it is a medical/health facility or by special request, then do full, in-depth design review.

2. Check Scope of Work for the list of issues to be reviewed.

   All other items will be A-E responsibility.

3. Check SOW for the list of project criteria.

   Verify that the correct criteria are referenced for the project.
   - MAJCOM Criteria
   - Required submittals
   - Base Criteria

4. Review Lessons Learned Checklist.

   Refer to *Integrating Lessons Learned [PROA04L0]*
   - The electrical designer should create the LL Checklist to be applied to the specific project design. The PM should provide a LL Checklist to any A-E for the specific project design.
   - The electrical designer should provide the Lessons Learned Checklist applied to the specific project design for review. Confirm the LL on the checklist have been incorporated into the project design.
   - Provide review comment in Dr. Checks notifying the designer of any specific Lessons Learned that need to be incorporated into the project.

5. Consult designers.

   Meet with A-E or IHD personnel at various stages of design to influence decision points:
   - Pre-design conferences and 10% reviews will be provided at the request of the specific discipline, etc.
   - Shift review from end to beginning stages.

6. Check Life Safety.
   - Fire alarm pull stations.
   - Sufficient fire alarm horns/strobes.
   - Fire alarm transmission – radio or telephone.
   - Check fire alarm riser diagram for completeness – water flow and tamper switches, PIV, duct smoke detectors, pull stations, horn/strobes, etc.
   - Smoke detector at each fire alarm panel and remote local processor (unless location is monitored 24/7).
   - Battery back up provided for fire alarm system.
   - Emergency and exit lights per NFPA 101.
   - Elevators comply with ASME A17.1, NFPA 70 and NFPA 72 requirements.
   - Potential hazardous locations are identified and designed in accordance with NFPA. Ensure areas adjoining hazardous locations receive proper treatment (ventilation, separation, 18” rise stairs, etc.)
   - Mass Notification System provided when required - in accordance with *UFC 4-021-01 Design and O&M: Mass Notification Systems [http://www.wbdg.org/ccb/DOD/UFC/ufc_4_021_01.pdf]*. Confirm if amber strobes are specified.

7. Check High Priority (but rare) Facilities.

- Is airfield lighting design in accordance with all applicable criteria?
- Do a full, in-depth plan check for medical/health facilities.

8. Check One-Line Diagram, Power Distribution and Calculations
   - Check for completeness in general.
   - Check electrical and physical sizes of major equipment – switchboards, distribution panels, MCC's, UPS's, ATS's, transformers, battery rooms.
   - Ensure proper working clearance around all electrical equipment per NEC.
   - Feeder and service conductors match their breaker size.
   - Transformer minimum impedances, short circuit ratings.
   - Surge arrester voltage rating.
   - Spot check calculations in D.A. to see if included and relatively complete (load calculations, short circuit, voltage drop, int./ext. lighting, and protective coordination if required).
   - TVSS devices provided?

9. Check Grounding.
   - Green ground wire in all conduits for air force and receptacles.
   - Include typical receptacle grounding detail.
   - Any special system grounding requirements, testing.
   - Lightning protection.
   - Communications system master ground bar detail.
   - Static electricity grounding receptacles provided for aircraft and fuel tanker vehicles.

10. Check Communications.
    - Pre-wire for air force; turnkey system for Army.
    - Riser diagrams, back board details, etc.
    - Check if proper category (Cat 6, etc.) of system provided.
    - Check if equipment per 1391, Para. 17 are included.
    - Wired per EIA/TIA.
    - Communications rooms adequate in size and quantity.
    - Cable tray used where prudent.
    - Communications rooms have adequate climate control.
    - Riser diagrams and device locations for intercom and PA systems provided when required.
    - Cable/Satellite TV system pre-wiring provided when required.
    - Ensure 300' rule for Ethernet is not violated.
    - Ensure adequate communications outlets provided, particularly in administrative areas, to accommodate varied furniture placement. Every 10' adjacent to most power receptacles is "adequate" in this context.
    - Are all RED/BLACK criteria satisfied?

11. Check Lighting.
    - ASHRAE 90.1 complied with, including supporting documentation.

- Light fixture schedule provided.
- Light fixture types selected use energy efficient lamps and ballasts.
- Minimum 85 CRI for F32T8 fluorescent lamps.
- Layout of light fixtures seems appropriate for uniformity, footcandle level, etc., in accordance with the latest edition of the IES Handbook and other relevant criteria.
- Sufficient details provided for lighting controls (as applicable).
- LED exit signs preferred. Exit sign fixture wattage not to exceed 20 watts. Avoid self-illuminating exit signs (except as allowed by Mil-HDBK-1008A, Para 2.5.1.1.
- Rooms and areas logically controlled with light switches, 3- and 4-way switches and dimmer switches, zoned banks of lighting, lighting pushbuttons and contactors, etc.
- Are required programmable lighting controls adequately detailed?
- Is a lighting control cabinet provided to control exterior lighting (if required)?
- Are the light fixture types selected suitable for the application (low glare with computers, etc.)?

12. Check Security.

    When required, depending on the facility:
    - IDS – riser and device locations shown.
    - ECS (access/entry control) – riser and device locations shown.
    - CCTV – riser and device locations shown.

13. Check Force Protection.

    No hidden locations around exterior electrical equipment where an intruder or bomb could hide.

14. Check Site Electrical Work.
    - Is proper coordination done with utilities such as PG&E and SCE for transformers, primary and secondary distribution, metering and electrical room access where applicable?
    - Are adequate manholes provided for power and communications?
    - Are spare ducts provided for primary, secondary and communications?
    - Is site lighting adequate, such as for building surrounds and parking lots?
    - Are site work details provided and properly referenced to site work?
    - Are underground conduits concrete encased for primary ducts and for other ducts under areas paved for vehicle traffic?
    - Are transformers and generators properly cited close to the electrical service entrance, behind buildings and/or behind screening walls?
    - Is adequate separation maintained between facilities and overhead electrical lines per ANSI C2?

15. Check Specifications.
    - Spot-check all required specs are provided and are edited.
    - Do specs match the plans? Are items in the specs that are not shown on the drawings, and vice-versa?

- Ensure latest editions of NEC, ANSI C2 are referenced.
- Reference California General Order No.'s 95 and 128 for California projects where applicable.
- PCB levels specified in 16370A and 16375A should be zero for new work, and should be less than 5 ppm for CA and 50 ppm elsewhere for rehab work.

16. Check Coordination.
    - Spot-check mechanical motor/equipment loads for proper voltage and phase ratings, etc.
    - Spot-check mechanical loads served by branch circuits.
    - Do electrical plans coordinate well with architectural, structural, civil, landscape and interior design drawings?

17. Proprietary names on drawings or in specs prohibited. The A-E must document exceptions with sole-source justification letter.

18. Accessibility Design Check.

    Refer to Americans with Disabilities Act (ADA)
    - Check device mounting heights – receptacles, communications outlets, fire alarm pull stations, light switches, wall mounted light fixtures.
    - Fire alarm strobes in bathrooms?

19. Check Design Analysis.

    This may unearth a problem.
    - Does it match the design?
    - Is criteria complied with?

20. Check Miscellaneous.
    - Is adequate detailing provided for solar power systems, including solar panels, inverters, disconnects, panel board and connection to utility power system?
    - Are solar panels oriented south, unobstructed and tilted at the proper angle (generally in the range of 0-30 degrees)?

21. Check legend, details and panel schedules.

22. Check Shop Drawings.

End of activity.

Flow Chart

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